

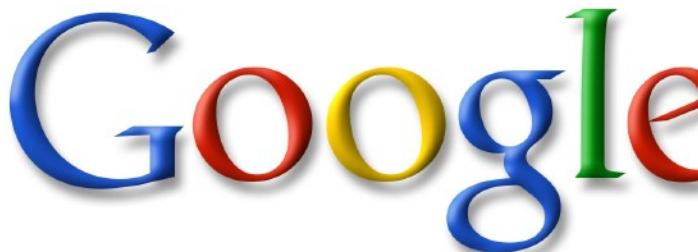
Exhibit 31

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Google Scoops Up Neural Networks Star DNNresearch To Boost Its Voice And Image Search Tech

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Well, Google's M&A strategy is nothing if not diverse in focus. In November, [it acquired package](#). Last month, Google [it made its first acquisition of the year](#), buying eCommerce startup Channel I dug into the Computer Science department at The University of Toronto to acquire [DNNresearch](#) by professor Geoffrey Hinton and two of his grad students, Alex Krizhevsky and Ilya Sutskever.

Incorporated last year, the startup's website is conspicuously devoid of any identifying information. While the financial terms of the deal were not disclosed, Google was eager to acquire the neural networks — as well as the talent behind it — to help it go beyond traditional search algorithms and pieces of content, images, voice, text and so on. [In its announcement today](#), the University of Toronto research "has profound implications for areas such as speech recognition, computer vision and language processing."

Furthermore, Professor Hinton is the founding director of the Gatsby Computational Neuroscience Unit in London, holds a Canada Research Chair in Machine Learning and is the director of the Canadian Institutes of Health Research-funded program on "Neural Computation and Adaptive Perception." Also a fellow of [The Royal Society](#), Hinton has become renowned for his work on neural nets and his research into "unsupervised learning with deep neural networks with rich sensory input."

In its statement, the University of Toronto said that both Krizhevsky and Sutskever will be moving to Google's Mountain View headquarters, "divide his time between his university research and his work at Google," both in Google's Toronto headquarters in Mountain View.

For Google, this means getting access, in particular, to the team's research into the improvements in the company looks to improve the quality of its image search and facial recognition capabilities. [It acquired Viewdle](#), which owns a number of patents on facial recognition, following its acquisition of PittPatt in 2011 and Neven Vision all the way back in 2006.

In addition, Google has been looking to improve its voice recognition, natural language processing and integrating that with its knowledge graph to help develop a brave new search engine. Google already has search capabilities on the web, but, going forward, as smartphones proliferate, it will look to improve mobile.

[In a recent paper](#) published by the three founders of DNNresearch, the team found that "despite CNNs [convolutional neural networks], and despite the relative efficiency of their local architecture, they are prohibitively expensive to apply in large scale to high-resolution images ... [However, the results]

large, deep convolutional neural network is capable of achieving recordbreaking results on a high using purely supervised learning."

Get that?

The acquisition of DNNresearch also follows a \$600K gift that Google awarded to Hinton and his their work in neural nets. Following its do-good thesis, the company pledged to "support ambitious science and engineering" through its ["Focused Research Awards program,"](#) which offer unrestricted grants and give recipients access to Google "tools, technologies and expertise."

So, it looks like Google discovered DNNresearch through its award program and, seeing the impact work could have on the fields of speech recognition, language processing and image recognition products — decided that a grant wasn't enough.

"Geoffrey Hinton's research is a magnificent example of disruptive innovation with roots in basic Toronto President David Naylor said in a statement. "The discoveries of brilliant researchers, guided by curiosity, and intuition, lead eventually to practical applications no one could have imagined, much

More in the University of Toronto's statement [here](#).

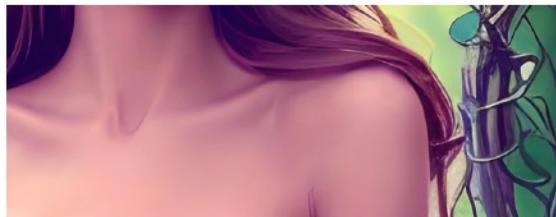
Update: Professor Hinton penned a [Google+ post today](#) that offers his take on joining Google or is betting on "Google's team to be the epicenter of future breakthroughs."

Full post below:

Last summer, I spent several months working with Google's Knowledge team in Mountain View, working with an incredible group of scientists and engineers who have a real shot at making spectacular progress in machine learning. Two of my recent graduate students, Ilya Sutskever and Alex Krizhevsky (who won the 2012 ImageNet competition) believe Google's team to be the epicenter of future breakthroughs. That means we'll soon be joining Google to work with brilliant engineering minds to tackle some of the biggest challenges in computer science. I'll remain part-time at the University of Toronto. I still have a lot of excellent graduate students, but at Google I will get to see what we can do with very large datasets.

Also, for those interested in some context as to the significance of Hinton within the scientific community, check out this [Hacker News thread here](#). Basically, he's Chuck Norris.

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